Stansilaw Paul Maj
SPM consulting
spm_consulting1@yahoo.com

Keywords:
Science of Learning, Cognitive Load Optimisation, Cognitive Load Theory

Learning areas:
Mathematics,
Science,
Design & Technology,
Digital Technology,
Integrated STEM

A New 21st Century Learning Theory that Quantitatively Defines the Simplest Learning and Assessment Paths Applicable to all Educational Sectors

Learning theories in use today (Constructivism etc.) were developed in the 20th Century and are based on guidelines informed by soft science principles. Guidelines are subjective and open to interpretation that can result in wide variations in learning outcomes.

In order to address this problem, there have been numerous global research programs in the Science of Learning (SoL). The Australian Science of Learning Research Centre (SLRC) was established to improve learning outcomes at all educational levels and developed twelve principles based on Psychology, Education and Neuroscience (PEN) e.g., PEN principle #1 "Written text and spoken word do not mix". However, all of the principles are guidelines only and not hard science.

The US National Science Foundation (NSF) established the Science of Learning (SoL) program with the goals of developing a fundamental understanding of learning. The NSF reported that much remains to be learned but that the goal of SoL is optimized learning for all. In order to translate SoL research into practical implementations the Deans for Impact defined six key questions with the associated cognitive principles and practical implications for the classroom. However, these are guidelines only and not hard science. To achieve the SoL goal of optimised learning for all what is needed is a quantitative, practical hard science-based learning theory that is easy to use, applicable to a wide range of disciplines at all educational levels resulting in significant improvements in teaching and learning outcomes in all modes of delivery.

In order to address this problem, I developed Cognitive Load Optimization (CLO). This 21st Century hard science-based theory is simple to use and provides a quantitatively defined optimum learning path that is used as the basis of instructional design and teaching. This optimum learning path is the simplest possible learning sequence. Furthermore, the numeric Cognitive Assessment Level (CAL) is used to create an integrated learning and assessment path between all educational sectors (school, college and university). In effect all learning paths and assessment standards are quantitatively defined. Published work to date has shown that using CLO results in significant improvements in learning outcomes for a wide range of STEM disciplines in both face-to-face and remote online modes.

Conclusion or future
CLO is theoretically applicable to other disciplines; however further work is needed. There is no comparable learning theory and CLO has the potential to fundamentally change teaching and learning.